UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TEXAS 75202 – 2733

February 15, 2019

Mr. Miguel Montoya
Quality Assurance Officer
New Mexico Environment Department
Surface Water Quality Bureau
P.O. Box 5469
Santa Fe, NM 87502-5469

Dear Mr. Montoya:

We have reviewed the Quality Assurance Project Plan (QAPP) entitled "*NM Rapid Assessment Method for Lowland Riverine Wetlands, Rio Grande/Lower Pecos and Regulatory Module for USACE, CWA Section 104(b)(3"* for Clean Water Act 104(b)(3) Cooperative Agreement CD-00F736-01-0. I am pleased to inform you that it was approved on February 13, 2019.

This new QAPP will expire on December 31, 2020. Should there be any changes to the QAPP at any time, please submit a revised document to EPA for approval. If the project continues under a new cooperative agreement and there are no substantive technical or programmatic changes, please submit a letter stating that no changes are needed. The letter or revised document is due at least 60 days prior to the expiration date.

Attached is the completed QAPP signature page for your records. In any future correspondence relating to this QAPP, please reference QTRAK #19-146. If you have any questions, you may contact me at (214) 665-2773.

Sincerely,

Leslie C. Rauscher

Leslie Rauscher
Project Officer
State/Tribal Programs Section

Attachment; sent via email, no hardcopy to follow.

New Mexico Rapid Assessment Method for Lowland Riverine Wetlands,
Rio Grande/Lower Pecos and Regulatory Module for USACE
CWA Section 104(b)(3) Wetlands Development Grant
CD# 00F736-01-0 (FY2013)

Quality Assurance Project Plan

Submitted by:
New Mexico Environment Department
Surface Water Quality Bureau

A Project Management

A1 Title and Approval Sheet

Maryann McGraw — Date: 11/15/2018
Wetlands Program Coordinator, SWQB

Miguel Montoya — Date: 11/15/2018
Quality Assurance Officer, SWQB

Abraham Franklin — Date: 11/15/2018
Program Manager, SWQB Watershed Protection Section

Leslie Rauscher — Date: 2/13/19
Project Officer, WQPD, EPA Region 6

Curry Jones — Date: 2/13/19
Chief, State and Tribal Programs Section, WQPD, EPA Region 6

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A2 Table of Contents

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A2.1 Acronyms

ABS	Above Sea Level
BAMI	Before and After Mitigation Impacts
CD	Compact Disc
CRAM	California Rapid Assessment Method
CWA	Clean Water Act
CWA 404	Section 404 of the Clean Water Act
DOQQ	Digital Orthophoto Quarter Quadrangles
DOT	Department of Transportation
DQI	Data Quality Indicators
DQO	Data quality Objectives
EPA	United States Environmental Protection Agency
FY	Fiscal Year
GIS	Geographic Information Systems
GPS	Geographic Positioning System
HGM	Hydrogeomorphic Method
HUC	Hydrologic Unit Codes
IT	Information Technology
MQO	Measurement Quality Objectives
NA	Not Applicable
NEPA	National Environmental Policy Act
NHNM	Natural Heritage New Mexico, University of New Mexico
NMED	New Mexico Environment Department
NMRAM	New Mexico Rapid Assessment Method
NWI	National Wetlands Inventory
OERR	Office of Emergency and Remedial Response
PDF	Portable Document Format
PO	Project Officer
PPE	Personal Protective Equipment
QA	Quality Assurance
QAO	Quality Assurance Officer
QC	Quality Control
QAPP	Quality Assurance Project Plan
RA	Rapid Assessment
RID	Request Identification Number
SA	Sample Area
SOP	Standard Operating Procedures
SQUID	Surface Water Quality Information Database
SWCA	SWCA, Inc.
SWQB	New Mexico Environment Department Surface Water Quality Bureau
U	University
USACE	United States Department of the Army Corps of Engineers
US EPA	United States Environmental Protection Agency
WOI	Wetland of Interest
WPS	Watershed Protection Section
WPC	Wetlands Program Coordinator

A3 Distribution List

This EPA-approved Quality Assurance Project Plan (QAPP) signed original will be kept on file at SWQB and a copy will be kept on file at the lead contractor's office (Natural Heritage New Mexico, University of New Mexico (NHNM)).

The Wetlands Program Coordinator (WPC) will ensure all members of the distribution list who do not have signature authority to approve this QAPP will review the QAPP and sign the Acknowledgment Statement prior to initiating any work for this project. The signed Acknowledgement Statements (electronic or hard copy) will be collected by the SWQB WPC/File Manager and will be filed with the original approved QAPP in the project files. The NHNM Director will ensure that any NHNM staff involved in data collection or analysis for this project have access to a copy of this QAPP, review its contents, and follow its quality assurance procedures.

Table A3.1 lists the names and organization of those on the distribution list and the roles and responsibilities of persons that will collect and/or use the information gathered for the classification verification, wetlands assessment, and multi-metric analyses.

Table A3.1: Distribution List with Roles and Responsibilities

Name	Organization	Role	Responsibilities	Contact Information
Abe Franklin	SWQB	Watershed Protection Section Program Manager	Review of QAPP.	(505) 827-2793 Abe.franklin@state.nm.us
Maryann McGraw	SWQB	Wetlands Program Coordinator; Project Oversite; File Manager	Principal Investigator, Assessment Team, assist in site selection, metrics selection, protocol and data management, data transfer and distribution activities. Coordinate technical advisory committee activities and serve as a member. Maintain Wetlands Program project files. Review of final project report and key deliverables including Field Guide and Manual. Liaison to EPA.	(505) 827-0581 maryann.mcgraw@state.nm.us
Miguel Montoya	SWQB	Quality Assurance Officer (QAO)	Review and approval of QAPP, QA audits, as needed, to assure adherence to the approved QAPP.	(505) 476-3794 Miguel.montoya@state.nm.us
Emile Sawyer	SWQB	Data Collection Team, Wetlands Team	Serve on technical advisory committee, assist with field data collection.	(505) 827-2827 emile.sawyer.state.nm.us
Todd Hochman	SWQB	IT SQUID Database Development Management	Develop electronic datasheets compatible with SQUID. Update SQUID to accept NMRAM data. Manager	(505) 827-0260 Todd.Hochman@state.nm.us

Name	Organization	Role	Responsibilities	Contact Information
Dan Gandhi	SWQB	Database Contractor	Develop electronic datasheets compatible with SQUID. Update SQUID to accept NMRAM data.	(505) 476-1619 Dan.Gandhi@state.nm.us
Esteban Muldavin	NHNM	Rapid Assessment Contractor	Assessment Team Leader, Project Manager, assessment design, site selection, protocol and data management, multi-metric analysis, data transfer and distribution activities, contribute to NMRAM Manual, and Field Guide.	(505) 277-3822 ex 228 muldavin@unm.edu
Elizabeth Milford	NHNM	Rapid Assessment Contractor	Project Coordinator, Team Coordinator, Assessment Team, management of NHNM contributing staff compilation of GIS layers for site selection, assist in site selection, protocol and data management, data transfer and distribution activities, contribute to NMRAM Manual, Field Guide, image classification, GIS management	(505) 277-3822 ex 227 Emilford2@gmail.com
Yvonne Chauvin	NHNM Senior Biologist	Rapid Assessment Contractor	NMRAM Data Collection and daily QA Crew Leader.	(505) 277-3822 ex 227 ydchauvin@gmail.com
Hannah Burnham	NHNM Biologist	Rapid Assessment Contractor	Assist in NMRAM data collection and classification verification and alternate Crew Leader, data transfer	hvarani@gmail.com
Leslie Rauscher	U.S. EPA	EPA Project Officer	QAPP review and approval	(214) 665-2773 Rauscher.leslie@epa.gov
Curry Jones	U.S. EPA	EPA Management	QAPP review and approval	(214) 665-8093 Jones.curry@epa.gov

A4 Project Task Organization

A project organizational chart (Figure A4.1) displays hierarchy of the project.

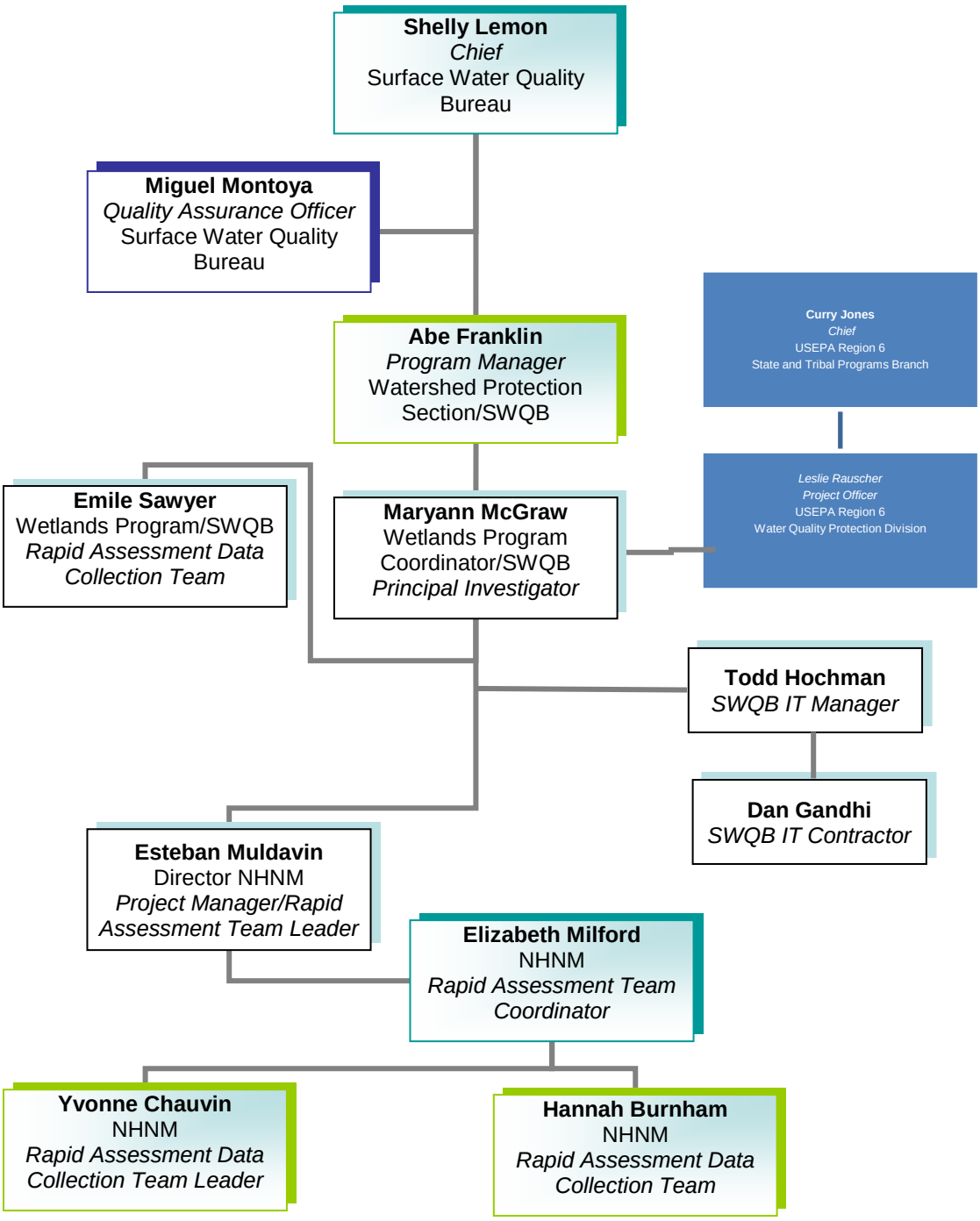

Figure A 4.1: Organizational Chart of Key Personnel.

A5 Problem Definition/Background

SWQB Wetlands Program is in the process of developing rapid assessment methods for New Mexico wetlands by subclass. This rapid assessment project is designed to develop and test metrics for the Lowland Riverine Wetlands Subclass of the Riverine Class of wetlands (Brinson et al. 1993) in Middle and Lower Rio Grande and the Lower Pecos Riverine wetlands of New Mexico. This project uses New Mexico Rapid Assessment Method (NMRAM), Lowland Riverine Wetlands Field Guide Version 1.1 (Muldavin et al. 2017) and electronic data collection worksheets that were initially developed in the Gila Watershed of New Mexico and subsequently refined. Protocols from the most recent draft version of the NMRAM Field Guide and datasheets for Lowland Riverine wetland systems will be used to continue to collect data to test revisions and refinements to the metrics and metric protocols. The data collection for this project is specifically restricted to the Rio Grande from Velarde to the Texas Border and the Pecos River below Santa Rosa Reservoir to the Texas Border in New Mexico.

All wetlands in the Rio Grande and Pecos floodplains that fit the subclass definition were identified within the Reference Domain and 45 Sample Areas (SAs) were assigned a preliminary ranking based on best professional judgment and familiarity with the wetlands by members of the NMRAM Assessment and Advisory Teams in 2015. Wetlands data were initially obtained from 21 Rio Grande/Pecos SAs in 2015 using methods and protocols developed for NMRAM Lowland Riverine Wetlands Field Guide Version 1.1 as well as using newly developed draft data sheets and protocols for the collection of data and testing of data collection protocols. These data were collected under the QAPP for this project that expired on December 31, 2017.

Currently data from the initial 21 lowland riverine SAs on the Rio Grande and Pecos are undergoing analyses and a refined version of NMRAM Lowland Riverine Wetlands metrics and protocols is being developed. The SWQB Wetlands Program and its partner Natural Heritage New Mexico, University of New Mexico (NHNM) propose to collect wetlands data from approximately 10 final selected SAs to test the final metric selection and protocols and electronic data collection worksheets. Data collection will include geographic information system (GIS) map evaluations using different land feature and land use map layers; field-based rapid assessment of landscape, abiotic, and biotic attributes; and completion of updated and revised stressor checklists.

The subclass for this study is defined as the Lowland Riverine Subclass for “big river” systems in central and southern New Mexico. The project area comprises the Rio Grande Floodplain Level 4 ecoregions of both Arizona/New Mexico Plateau Region and the Chihuahua Region (Rio Grande), and the Pecos River floodplain within the Conchas/Pecos Plains and Chihuahuan Basin and Playas Level 4 Ecoregions (Pecos) within the Southwestern Tablelands and Chihuahuan Deserts Regions. The “Lower Rio Grande mainstem below Velarde to the Texas Border and Pecos River mainstem below Santa Rosa Reservoir to the Texas Border” is the Reference Domain for the current study (Figure A5.1). The subclass includes lowland fifth order or greater streams (>1300 cfs bankfull discharge) occurring at elevations below mid-montane riverine wetlands (below 5500’ ABS) and in broad alluvial valleys where the grade changes to gently sloping to nearly flat (<0.02-0.0001) The streams may be perennial or intermittent. They may be single thread systems, the main channel having defined bank and bed indicative of overbank flows which supports a riparian zone. Or the stream may be multi-thread (braided or anastomosing) caused by deposition and distribution of high sediment loads that encounter a sudden reduction in flow velocity. In a braided stream, there may be a main low-flow channel with side channels that carry flow during bankfull and higher flow events instead of overbanking. The side channels provide pathways to riparian zone

inundation and infiltration. Braided stream systems also can be characterized by the channel divided into a number of smaller, interlocking channels by longitudinal bars and high system mobility. Braided channels tend to be wide and shallow and bedload materials are often dominated by non-cohesive coarse sands and gravels.

The basic assumption underlying this rapid assessment method is that wetland condition will vary along a disturbance gradient and that the resultant state can be evaluated based on a set of landscape-level measurements in combination with visible field metrics and the characterization of stressors that affect wetland ecological integrity. The purpose of defining a subclass is to reduce the natural variability in wetland type as well as variability that occur with latitude, altitude, climate and geomorphology. The selection of SAs within the subclass is to collect rapid assessment data from the best available to the most degraded sites to represent the continuum of conditions.

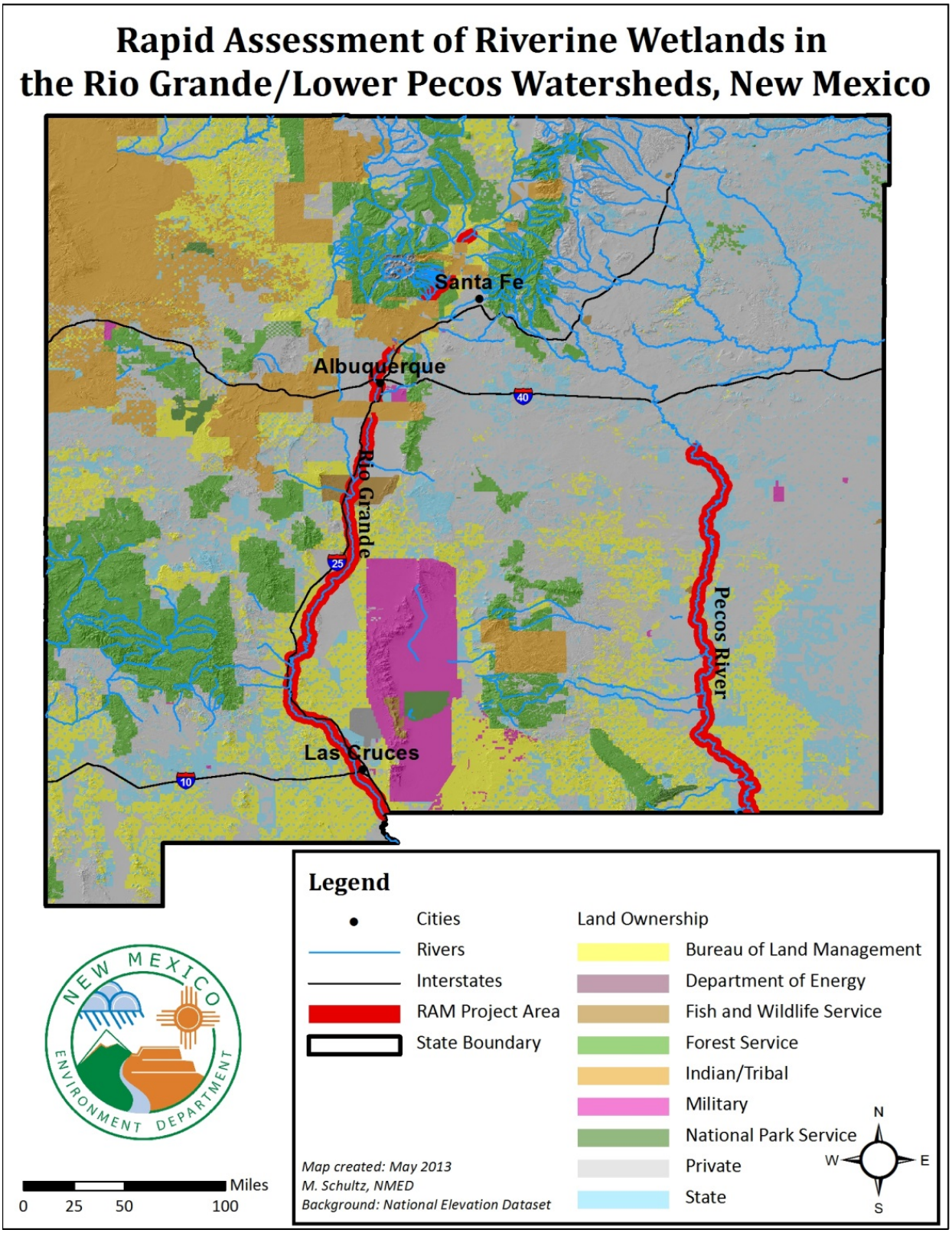

Figure A5.1 Reference Domain Boundaries of the Lowland Riverine Subclass for this project.

A6 Project and Task Description

A primary goal of this version of NMRAM is to provide a combination of Level 1 landscape (office based) and Level 2 rapid assessment (field-based) methods to evaluate the environmental condition or status of riverine wetlands along unconfined reaches of the mainstem (4^{th} and 5^{th} order Lowland Riverine) Lower Rio Grande and Lower Pecos Rivers in New Mexico. The NMRAM is meant to provide a cost-effective tool to obtain information about the condition of wetlands that may be employed by a variety of users from different agencies and institutions. Additional objectives for NMRAM development include identifying and evaluating 1) abundance, distribution and condition of wetlands in the subclass within the region, including associated habitat, water quality, and flood control functions, above a threshold to maintain ecological services; 2) reference wetland conditions within the subclass; 3) wetland protection needs for the subclass; 4) potential wetland restoration parameters and metrics that may be used to measure wetland restoration effectiveness and recovery; 5) the effects of environmental stressors within the wetlands; and 6) locations to serve as restoration opportunities for the subclass within the region.

The draft set of NMRAM GIS and field metrics and field sheets will be used for data collection to:

1) determine the limits, attributes and size of an appropriate SA
2) verify the suitability of the selected metrics to inform condition of the wetland
3) calibrate metrics sensitivity relative to range of variability in wetland condition
4) determine the time and effort it takes to conduct the NMRAM Lowland Riverine Wetlands
5) determine how stressor type, location and intensity relates to wetland condition
6) determine the level of experience needed for a team to conduct the NMRAM
7) determine site scoring and weighting factors based on condition
8) determine the utility of electronic datasheets in the field and for uploading data into the SQUID database
9) determine if the outcome provides the information needed to meet the SWQB project goals.

To develop the NMRAM, additional validation data collection by the field teams (in addition to using the draft metrics) will be collected to:

1) further characterize and describe wetlands of the Lowland Riverine subclass
2) improve selected abiotic metrics to ensure sensitivity to anthropogenic stress
3) improve site scoring based on condition

The field botanist (Yvonne Chauvin) will complete floristic quality plant data collection at each site using UNM plant database datasheets to validate the NMRAM biotic metrics. These data will also be used by UNM Natural Heritage Division (Elizabeth Milford and Yvonne Chauvin) to complete image classification of all floodplain wetlands used in the NMRAM Lowland development along with 2014-2015 NAIP Imagery.

Table A6.1 Tasks, Timeline and Products

Task	Timeline	Products
Development of NMRAM metrics	ongoing	Draft metrics, Field Guide and datasheets for NMRAM Lowland Riverine.
Select final rapid assessment SAs	January 2019	GIS maps prepared for the reference domain and lowland riverine wetland sites selected that represent the subclass of wetlands under study.
Prepare QAPP for NMRAM Field Data Collection	October 2018	QAPP prepared and forwarded to EPA for review and approval.
Advisory Team Meeting and obtain permission to enter	March 2019	Final Advisory Team meeting to review Lowland metrics and final recommendations. Permission to enter all wetlands rapid assessment field sites (Sampling Areas (SA)).
Data Collection (field) Team training	March 2019	The NMRAM Data Collection Field Team trained at representative sites within the geographic reference domain for Lowland Riverine Wetlands.
Data Collection	March-April 2019	Data Collection Field Team will spend approximately 12 field days on 10 sites starting April 2019. Completion of data collection.
Data Entry	April 2019	Upload data into NMED SQUID database for Lowland Riverine NMRAM.
Prepare draft classification maps	May 2019	Submit draft vegetation classification to Project Coordinator for initial validation.
Complete image classification based on field data collection	May 2019	Complete final classification of vegetation type (e.g., cottonwood, willow, sedge grasses, etc) and other prominent attribute types (e.g., water, gravel bar, sand bar).
Final Multi-metric analysis, recalibration and validation	May 2019	Analyze and incorporate data into rating curves, score sites, validate, recalibrate, re-evaluate metrics.
Conduct User's workshops	Spring 2019	Present NMRAM Lowland Riverine Wetlands to potential agency and contractor field personnel and conduct training for each using revised Field Guides and datasheets.
Complete NMRAM Manual Module, NMRAM Field Guides and Electronic datasheets	May 2019	NMRAM Lowland Manual Module, Field Guide and electronic datasheets.

A7 Quality Objectives and Criteria for Measurement Data

This section describes the data quality objectives of the project, identifies the targeted action limits and levels, and defines the measurement performance of acceptance criteria deemed necessary to meet those objectives.

The purpose of this project is to expend the knowledge of the condition of wetlands associated with lowland river systems in New Mexico. Data quality will be measured against the quantitative and qualitative data quality indicators described below.

Table A7.1 Data Quality Indicators

Data Quality Indicator	Data Acquisition
Precision	Precision will be ensured by consistently assigning the same staff the responsibilities of collecting, recording and analyzing data.
Accuracy	Accuracy is based on the use of methods determined to be reliable and tested through the pilot and subsequent field inventory components.
Bias	Bias will be reduced by using professional and experienced staff to collect and analyze data.
Representativeness	Sample selection is representative of the varied continuum of reference conditions needed to develop the methodology.
Comparability	Methods for data collection are standardized and reproducible from the development and adherence to this QAPP.
Completeness	All known sites within the subclass were selected to assess the range of conditions. All metrics data will be collected for each of the SAs to ensure completeness.
Sensitivity	Analyses will be conducted to ensure sensitivity of metrics to environmental conditions and recalibrated as applicable as part of the methodology development.

A8 Special Training Requirements/Certification

SWQB has qualified and experienced scientific staff, with expertise in GIS, wetland identification, Rosgen classification and methods, the development of rapid assessment methods, and southwestern riparian ecosystems to help carry out and administer this project. In addition, the SWQB Wetlands Program is using qualified contractors with extensive experience in New Mexico's wetlands and in the development of rapid assessments, biotic integrity, riparian vegetation and hydrology, and field work to carry out this EPA-funded Rapid Assessment of Wetlands (Natural Heritage New Mexico), which will include a validation of spatial attributes applied to the assessment sites. The Assessment and Data Collection Teams for Rapid Assessment will be given a copy of this QAPP and will be instructed in appropriate data collection, validation and ground truth techniques.

Maryann McGraw (WPC), received her bachelor's and master's degrees in geology form the University of Texas at Austin, and is an Environmental Scientist/Specialist Supervisor for SWQB. Maryann has been the principal investigator and contributing author for all NMRAMs to date. She has attended advanced training sessions in fluvial geomorphology assessment of stream conditions and departures conducted by Dave Rosgen, California Rapid Assessment Method (CRAM), HGM training, NWCA training and Stream Pyramid Training. The WPC has also participated in training and data collection for NWCA (2011), conducted greenline monitoring of riparian areas and SWQB photo monitoring protocols for other wetlands projects. She participated in the development of the Rio Puerco Monitoring Manual. She worked for the Los Luna Plant Materials Center propagating wetland plants. She is qualified for developing the assessment criteria,

conducting and participating in the training, and for overseeing and managing any of the monitoring procedures specified for this project.

Emile Sawyer serves as data collection technician for this project. He is an Environmental Scientist-Specialist and Wetlands Program team member for the Surface Water Quality Bureau, based in the Santa Fe Office. Prior to attending New Mexico Highlands University, where he earned his Environmental Science - Geology degree in 2003, Mr. Sawyer worked from 1992 to 2003 as a contract forestry technician throughout the Rocky Mountains. He earned his M.S. in Hydrogeology from the University of Nevada - Reno in 2009. Mr. Sawyer's graduate research at the Desert Research Institute in Reno, Nevada was based on using stable isotopes to track groundwater flow and evaluate a water balance model in the Colorado Flow System of eastern Nevada.

Contractor qualifications are documented through resumes and professional references. The qualifications have been reviewed by the SWQB WPC for this project. The documentation of this information will be kept in the SWQB project files managed by the File Manager. NHNM staff resumes were submitted with the project proposal to EPA and are available from the project File Manager.

A9 Documentation and Records

Copies of this QAPP and any subsequent revisions will be provided to all individuals included on the distribution list by the SWQB WPC. Signed Acknowledgement Statements will be filed with the original approved QAPP in the project files.

The WPC will also distribute all applicable protocol documents and subsequent revisions used throughout the project to the appropriate contractors. NHNM will prepare and submit quarterly project reports. These will be submitted to NMED, in accordance with the approved QAPP. The QAPP, protocol documents and reports will be maintained on the SWQB WPC's hard drive, SWQB server (File Depot) and in the project file at SWQB Santa Fe, and at NHNM.

This QAPP includes references to protocols for the development and testing of written procedures for all methods, metrics and procedures or protocols related to the collection, processing, analyses, reporting and tracking of environmental data. All data generated from this project and covered by this QAPP will be of sufficient quality to withstand challenges to their validity, accuracy and legibility. To meet this objective, data are recorded in standardized formats and in accordance with prescribed procedures.

The documentation of all environmental data collection activities will meet the following minimum requirements:

1. Data, data collection and analytical methods, and associated information must be documented directly, promptly, and legibly.
2. All reported data must be uniquely traceable to the raw data. All data reduction/transformation formulae must be documented.
3. All original data records include, as appropriate, a description of the data collected, units of measurement, unique sample identification (Request Identification [RID] number), station or location identification (if applicable), name and signature or initials of the person collecting the data, and date of collection.

Any changes to the original (raw data) entry must be clear and not obscure the original entry. Taxonomic refinements and translational typographic errors will be corrected on the field datasheets and in the database, with clear documentation of what and by whom those changes were made.

A9.1 Reporting Format and Storage

All field data will be recorded each day and for each metric on project-specific field data sheets. The field crew will scan a representative sample and email them to the SWQB WPC. After the field work, the NHNM Team Coordinator will assign NHNM personnel to enter the data into the NHNM database. Typically, this task is assigned to several personnel to reduce fatigue. Assigned staff may include the NHNM Team Coordinator, Data Technicians, interns, or contractors (e.g. botanist). The personnel entering data from a datasheet will sign and date each sheet when it is complete. The NHNM database requires a username, password, and specific permissions to access and edit data, and tracks the username and date when records are added or edited. Once the data have been entered and corrected, the Team Coordinator will assign NHNM staff to scan the field data sheets if not already electronically generated; these will be delivered to the SWQB WPC. The Surface Water Quality Information Database (SQUID) is the central repository for NMRAM data at SWQB. NHNM will deliver the data into a geodatabase that includes all related tables and metadata to NMED for inclusion in SWQB project files until SQUID is prepared for Lowland Riverine NMRAM data entry. The SWQB WPC will ensure these data are entered SQUID by December 2019. Copies of the paper datasheets will be kept in the project file at SWQB and at NHNM office. A list of SAs visited and site scores will be provided by the WPC to EPA Region 6 Wetlands Program as a deliverable attachment to the semi-annual reports. The data collection report produced by the NHNM and SWQB will include scans of the data collection worksheets in an appendix.

B Data Generation and Acquisition

B1 Sampling Design

The selection of the Lowland Riverine Wetland Subclass in the Lower Rio Grande and Lower Pecos Watersheds reference domain was based on SWQB priorities. This wetland subclass was selected based on a prioritization of wetland types and:

1. existence of potential best available reference sites
2. access
3. relation to existing SWQB water chemistry data collection sites
4. potential for impairment by future stressors (anthropogenic activities)

All potential riverine wetland areas representative of the lowland riverine subclass were initially identified within the Lower Rio Grande and Lower Pecos geographic reference domain. The individual sites representing the wetland lowland riverine subclass were selected by visually inspecting Rio Grande/Pecos unconfined floodplains below the elevation range 5,500 feet ABS in the GIS. Riverine waters were identified using SWQB 305(b) waters GIS layers over a background of digital orthophoto quarter quad (DOQQ) layers for the target reference domain. The GIS layers are organized into ArcGIS 10.2 databases and each floodplain system was reviewed for floodplain segments greater than 500 m width. Polygons were drawn over each floodplain segment.

The polygons were reviewed for consistency and then broadly ranked by degree of disturbance. The August-September 2015 field data acquisition was narrowed down to 45 selected sites for the NMRAM Lowland Riverine subclass. The sites were selected based on available access and representation of the range of disturbance.

Draft metrics selected by the Assessment Team for testing in 2019, will be incorporated into electronic data collection worksheets. Draft metrics will represent relevant attribute categories such as Landscape Context, Size, Biotic, and Abiotic (Table B1.1). The metrics are measured using maps and aerial imagery or evaluated in the field. Landscape Context and Size metrics are assessed using maps and/or a GIS and these are termed “Level 1” metrics (Fennesey et al 2004). Landscape Context metrics usually are evaluating conditions surrounding the SA (the Buffer, Riparian Corridor, or Land Use Zone) and are preferably completed before going into the field to help familiarize the team with the site. Size metrics are also measured using maps. Level 1 metrics are also confirmed or modified as necessary during the field survey.

Table B1.1. Major categories of indicators, sample indicators and assessment level of effort used in wetland rapid assessment methods.

ATTRIBUTE	INDICATOR	LEVEL
Hydrology (Abiotic)	Hydrologic Alterations	2
	Hydroperiod	1
	Surface Water Connectivity	2
	Flood Storage Potential	2

	Water Sources	1 and 2
	Maximum water depth	2
Soils/Substrate (Abiotic)	Substrate Disturbance	2
	Microtopography	2
	Sediment Composition	2
Vegetation (Biotic)	Degree of Interspersion	1
	Extent of Invasive Species	2
	Endangered/threatened species	1 and 2
	Presence and cover of wetland plant species	2
	Vegetation Vertical Structure	2
	Course Woody Debris	2
	Dominant Vegetation	2
	Native Riparian Tree Regeneration	2
	Relative Native Plant Community Composition	2
Landscape Context and Size	Size	1
	Relative Wetland Size	1
	Surrounding Land Use	1
	Riparian Corridor Connectivity	1
	Extent and Condition of Buffer Zone	1
	Wetland Configuration	1

In contrast, Biotic and Abiotic metrics are determined and evaluated in the field. Rapid field-based metrics are termed "Level 2" metrics. Biotic metrics may be based on floristic or wildlife data that represent habitat condition. Abiotic metrics may be based on hydrology, geomorphology, physical features, or soil conditions. Level 2 metrics are sensitive to disturbance and can be collected by using data collection methods or observations with direct results in the field or by matching features within the SA with narrative descriptions identified in past NMRAM's. Rapid assessments do not use methods that require lab analyses or other intensive methods which would be considered Level 3. In addition, a draft set of field-based stressor checklists grouped by attribute class are completed during the field survey along with annotated field maps and documentary photographs. During the 2019 data collection, the Field Teams will take additional notes and photographs to provide feedback to the Assessment Team as to how the draft metrics are applied, details for describing the application of the metrics, stressors that are evident, and other comments that will help in the development of a suite of metrics that evaluate wetland condition.

After completion of data analysis from the 2015 data collection effort, further metric, protocol, and stressor refinement will be tested on approximately 10 SAs selected for 2019 field season data collection.

The NMRAM Field Guide for Lowland Riverine Wetlands will provide procedures for conducting a rapid ecological assessment of wetlands in lowland riverine systems. It will provide specific protocols and datasheets for evaluating wetland ecological condition using a combination of GIS-based measurements and field surveys. In addition to details on metric measurements, appendices will be provided that include at minimum, the data collection worksheets, a plant species list with wetland indicator status, an invasive plant species list and a glossary of terms.

Stressors will be evaluated and documented on the stressor checklist during the field survey. Maps will be annotated with data collection site details, changes to landscape and size metrics and other features of note in the SA and the surrounding buffer. Documentary photographs allow the Field Team to relate findings back to the Assessment Team as well as supporting choices and data collected in the field. Documentary photographs are also taken of plant species that need further identification and as supporting documentation for plant communities identified in the SA. Photographs are used as supporting data collection and are generally not considered a metric or used as data by themselves.

Metric scores based on Level I analysis and field data (Level 2) are weighted by importance and rolled up into an attribute score (i.e., Size, Landscape Context, Biotic and Abiotic Scores) where A = Excellent (≥3.25-4.0); B = Good (≥2.5-<3.25); C = Fair (≥1.75-<2.5), and D = Poor (1.0 - <1.75). The rationale behind scoring procedures and the efficacy of any given metric will be provided in the NMRAM Manual.

A set of worksheets organized by attribute classes (Appendix F2) will be refined to support efficient data capture**.** These data collection worksheets will be provided as printable forms in Appendix A of the Field Guide and as a downloadable fillable PDF file that computes and rates most metrics automatically and rolls up the scores for the user. The worksheet packet contains a cover worksheet for recording basic information, surveyor identification, and narrative descriptions of the SA by attribute. The worksheets together with maps and photographs make up the NMRAM Assessment Package that becomes the supporting record at a project level and the tool for data entry into SQUID. A Team Leader will check field sheets for accuracy and completeness prior to leaving the SA. A representative set of field sheets will be scanned and sent to the WPC and/or NHNM Program Manager for further inspection and review.

B2 Sampling Methods

All NMRAM sampling protocols will be included in the draft NMRAM Field Guide for the Lowland Riverine Subclass and include written procedures for all methods and procedures or protocols related to the collection, processing, analysis, reporting and tracking of environmental data associated with this project. The draft NMRAM data collection worksheets (Appendix F2) for the Lowland Riverine Subclass will be finalized for data capture and data entry into SQUID once the metrics are tested and accepted as accurately representing the condition of the wetland of interest.

The draft metrics will be designed to measure aspects of condition that are relative to the reference conditions based on the literature cited in the reference section of this QAPP and on best

professional judgment. Potential metrics are not limited to those in the literature but are provided as an example of the types of data to be assessed.

B2.1 Surface Water Sampling at Confined Riverine Wetland sites

No water samples will be taken for the NMRAM for Lowland Riverine Wetlands.

B2.2 Field Health and Safety Procedures

The NHNM/SWQB data collection team will conduct field trips to complete assessment work. These will be scheduled during early spring 2019. Field data collection will be scheduled to avoid thunderstorm activity and flooding, and in warmer weather while plants are more likely to be in bloom for purposes of identification.

Safety is of primary importance to field studies. Only sites that are safely accessible will be sampled. Unsafe sites include, but are not limited to, private lands not granting permission access, areas with evidence of illegal activities, exceptionally steep-sided and unstable slopes adjacent to rivers and acequias, and swift water and flooding.

In remote areas, the data collection team will always carry sufficient supplies of water, food, flashlights, shovels, extra spare tires, and first aid and emergency supplies to deal with accidents and unexpected circumstances, such as rapid changes in weather. Hard hats and closed-toe boots are required in burned or construction areas. Teams should have adequate communication devices for their location (cell phones, GPS, etc.). A field team will consist of at minimum a botanist, a hydrogeologist, and technical assistants. A designated crew leader will be determined by NHNM Project Coordinator and WPC during the Field Team training before data collection field trips, and will be responsible for field trip decisions, crew performance, and data compilation. At least one team member will have swift water training.

Any invasive species will be identified during data collection at the wetland SAs. Measures will be taken to prevent the carrying of seeds and propagules from site to site including the visual inspection and sterilization of shoes, clothes and equipment. Measures and procedures for invasive species control are included in the NMRAM for Lowland Riverine Wetlands Field Guide for users.

B2.3 Field Variances

As field conditions vary there may be the need for safety, common sense, or local site variables that prohibit or require minor adjustments to the sampling procedures and protocols. Such changes will be reported to the crew leader and that information passed on to the QAO. If there is a deviation from the QAPP, the project manager/project coordinator must notify the QAO and provide written notification of the proposed changes and explanation on the reasoning behind the change. Upon the QAO's approval, modification to the QAPP will be sent to the US EPA for review and approval. Sampling problems, minor adjustments of field sampling, and QAPP modifications will be documented in any semi-annual reports to US EPA.

B2.4 Decontamination Procedures

Field equipment and shoes will be decontaminated between sites using a dilute bleach solution. This decontamination procedure is needed to prevent the spread of aquatic and terrestrial invasive species. Field clothing, including boots, will be decontaminated using a dilute bleach solution

either in the field or by frequent laundry machine application. Disposal of decontamination fluids and rinse fluids is described below under “Disposal of Residual Materials”. Any gloves used during the sampling regime will be considered disposable and will be packaged for disposal appropriately between sites.

B2.5 Disposal of Residual Materials

In the process of sampling there may be a small amount of waste, including used personal protective equipment (PPE). The US EPA's National Contingency Plan requires that management of the wastes generated during sampling comply with all applicable or relevant and appropriate requirements to the extent practicable. Residuals generated for this project will be handled in a manner consistent with the Office of Emergency and Remedial Response (OERR) Directive 9345.3-02 (May 1991), which provides the guidance for the management of wastes. In addition, other legal and practical considerations that may affect the handling of the wastes will be considered, as follows:

Used PPE and disposable containers or equipment will be bagged and placed in a municipal refuse dumpster. These wastes are not considered hazardous and can be sent to a municipal landfill. Any used PPE and disposable containers or equipment (even if it appears to be reusable) will be rendered inoperable before disposal in the refuse dumpster.

Decontamination fluids generated in the sampling event could consist of water and bleach. Decontamination fluids will be disposed into a municipal sewerage or onto an impervious surface for evaporation, at least 50 m from the nearest surface water.

B3 Sample Handling and Custody

No samples are expected to be collected for analysis at a laboratory for this project.

B4 Field Measurement Methods

Relevant metrics using Rosgen Level 2 geomorphology surveys techniques, such as cross-sections and longitudinal profiles, may conducted at the 10 selected 2019 SAs in the Reference Domain. Methodology will follow that developed by Rosgen (1996) Applied River Morphology. Surveys will be located by GPS points for future data collection efforts to ensure repeat surveys are recreated accurately.

Plant communities will be documented using photographs and recorded on the data collection worksheets throughout the SA. Photograph site locations will be recorded using a GPS to ensure accurate creation of the plant community map. Photo documentation will occur during Spring 2019 data collection. Other documentary photographs include transect locations upstream, downstream from bank to bank. Photograph documentation details will be recorded on the data collection worksheets on designated photo-documentation pages.

B5 Quality Control

Quality control (QC) activities are technical activities performed on a routine basis to quantify the variability that is inherent to any environmental data measurement activity. The purpose for conducting QC is to understand and incorporate the effects the variability may have in the decision-making process. Additionally, the results obtained from the QC analysis, or data quality assessment, may identify areas where variability can be reduced or eliminated in future data collection efforts, thereby improving the overall quality of the project being implemented. Many of the proposed metrics consist of observation data including plant species lists and site geomorphology. To ensure quality control for these observational data, the data collection team will have subject matter experts. For example, the team will include a trained or degreed botanist and hydrogeologist to eliminate errors.

B5.1 Field Sampling Quality Control

All Data Collection Team members who collect environmental data must be trained in the use of the metric protocols and will collect data in accordance with the procedures as they are defined in the draft NMRAM Field Sheets and at the training session. Training session will be led by one of the following project staff: SWQB WPC, SWQB Wetland's Team, NHNM Project Manager or NHNM Project Coordinator.

Several potential metrics lend themselves to observer bias, particularly estimation and measurement of vegetation cover and land use cover. Density estimation sheets are useful for training and calibration of field team members and will be part of the NMRAM Field Guide if other sources are not available. Results of all Data Collection Team training prior to field data collection and calibration efforts will be documented and provided by NHNM in quarterly reports to SWQB.

B5.2 Data Entry Quality Control

Field sheets will be organized, reviewed for completeness and placed in a labeled file folder by the team leader. The fillable PDF data collection worksheets flags entries or values that are not consistent with that expected for the metric. NHNM trained support staff will enter the data into NHNM database other than the individual who filled out the field sheet. Should any questions arise, the data entry personnel will add a note to the field sheet and contact the field team member to answer that question. When each data point from a page has been addressed, the data entry staff person will sign and date the field sheet. The NHNM Program Manager and the WPC will review all data, using standardized exported reports that identify missing values and outliers.

B6 Instrument/Equipment Testing, Inspection, and Maintenance

The NHNM Team Coordinator and the Data Collection Team Leader are responsible for inspecting equipment and supplies before the Data Collection Team leave for field data collection field trips and upon return to NHNM office.

B7 Instrument/Equipment Calibration and Frequency

Rosgen Level 2 measurements will be limited to those that can be collected using a tape measure and level. There are no instruments/equipment that require calibration.

B8 Inspection and Acceptance of Supplies and Consumables

B8.1 Field Sampling Supplies and Consumables

The NHNM Team Coordinator is responsible for preparing equipment and supplies checklists and informing the Data Collection Team leader of needed supplies and equipment for each field sampling trip. Contractor field sampling supplies and consumables are checked at the end of every field trip by the Data Collection Team Leader. Replacement supplies and consumables are purchased as needed and checked before the next field trip. All team members are expected to be familiar with the equipment and supplies needed for an individual trip. A copy of the checklist is reviewed and completed during trip planning.

B9 Non-Direct Measurements

Printed field maps for each SA are an integral part of the NMRAM Assessment Package. Printed field maps will be prepared for each SA by the NHNM Team Coordinator. Two different map formats are required to support field mapping and the field survey; 1) A map at approximately 1:6000-10000 scale that shows the SAs in a landscape context. This map should delineate the maximum extent of a potential buffer and land use index area. 2) a map that encompasses a single SA at between 1:1500-3000 scale for mapping vegetation communities, abiotic features and transect locations. Two copies of the field maps are required, one for measuring biotic metrics and one for measuring abiotic metrics. Modifications to the SA boundary will be recorded on the SA abiotic map.

B10 Data Management

Data obtained for this project are maintained in a relational database and GIS electronic files at NHNM and SWQB. All electronic data will be filed and labeled in a consistent manner. All data will be delivered to the WPC as soon as practical following data collection event. All data are secured through password protection and are unavailable to unauthorized users, to protect from accidental manipulation. Exported geodatabases that are delivered to the SWQB contain metadata that includes the date of export. Data transmitted to the SWQB and advisory committee are available at NHNM, on the SWQB hard drive, SWQB server (File Depot) and in hard copy form as Wetlands Program files that are maintained by the SWQB File Manager.

NHNM will provide summary reports to the SWQB WPC. All data and summary reports will be compiled into the semi-annual and final project report and provided to US EPA Region 6 Wetlands Program.

B10.1 Data Acquisition, Direct Measurements

Expeditious data entry helps ensure field team memory of site-specific details, and ability to respond to questions by the WPC and NHNM project managers about questionable data.

NHNM follows three data acquisition principles:

1. It should be highly efficient, requiring no more time to enter the data than it did to collect them.

2. The data entered should be restricted to assure accuracy and consistency, with terminology, scientific names, and responses limited to values in lookup tables, yet have the flexibility to allow for anomalous occurrences.
3. Users must be able to easily export meaningful data.

C Assessment and Oversight

C1 Assessment/Oversight and Response Actions

The SWQB WPC provides project oversight by reviewing data collection efforts. The NHNM Data Collection Team leader provides day-to-day oversight during data collection activities including adherence to this QAPP. Any problems encountered during the course of this project will be immediately reported to the SWQB WPC, who will consult with appropriate individuals to determine appropriate action. Should the corrective action impact the project or data quality, the SWQB WPC will alert the QAO. If it is discovered that NMRAM methodologies must deviate from the approved QAPP, a revised QAPP must be approved before work can be continued. All problems will be documented for inclusion in the project file, semi-annual and final reports. The SWQB will assess project progress to ensure the QAPP is being implemented, including periodic audits by the QAO, as needed. Those assessments and any problems will be reported by the SWQB WPC to the QAO.

C2 Reports to Management

Quarterly reports will be prepared and reviewed internally by the NHNM Team Coordinator and presented to the SWQB WPC for review. Any deviations from the specifications in the NHNM Memorandum of Agreement for this project will be documented and reported to WPC. Following inclusion of SWQB review comments, NHNM Team Coordinator will submit finalized reports to the SWQB WPC, who will present those reports to the US EPA Grants Project Officer, to show project accomplishments, data acquisition and entry, and to provide a venue to bring up any issues with the project. The reports will allow the US EPA to assess the productivity of the NMRAM for Lowland Riverine Wetlands project and be kept informed on the progress of the project. A report detailing the findings will be provided in the final project report to US EPA by SWQB. The field guide and manual will serve as major documentation of the NMRAM for Lowland Riverine Wetlands, and will relate the findings to several different NMRAMs, covering different wetlands types in New Mexico.

D Data Review and Usability

D1 Data Review, Verification, and Validation Requirements

Prior to using the data for wetlands protection, policy, or public uses, the quality of the data will be reviewed and evaluated, as described in Sections B10.1 and C1, above. Data are compiled from field sheets, reviewed and verified by NHNM staff that did not enter those data, and re-verified and validated by NHNM Project Coordinator. Errors will be corrected where possible and rejected and reported upon by the NHNM if questions about those data cannot be satisfactorily answered. Additional review, verification, and validation will be completed by SWQB WPC. Standardized and randomized checks of data entry, field calibration of instrumentation, and technician training will be conducted and reported upon by the NHNM, and data error levels above 1% will not be accepted. These data review, verification, and validation efforts will ensure NHNM provides high quality assessment data to SWQB.

D2 Verification and Validation Methods

Defining the data verification and validation methods helps ensure that project data are evaluated in an objective and consistent manner. For the current project, such methods have been described in Section D1 (above) for information gathered and documented as part of the field measurement activities.

D3 Reconciliation with User Requirements

NHNM, in collaboration with SWQB and the Technical Advisory Committee, will use the assembled pilot study data and the 2015 data and analyses to clarify issues related to protocol adequacy, completeness, and efficiency. The data assembled through the larger inventory and assessment will be used to further those analyses, and to address the question of the applicability of the methods to demonstrate the utility of the NMRAM for Lowland Riverine Wetlands in New Mexico. Critical analyses here will include the adequacy of the methods for identifying individual sites that are exemplary and of use as reference sites, sites at which management attention is warranted, and site at high levels of risk due to anthropogenic impacts. Such analyses will be conducted using ranked, non-parametric statistical analyses, and multivariate analyses of the diverse physical, and biological ranking. These analyses will help clarify the utility of the project to meet the management and policy needs of the State of New Mexico.

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Appendix F1 Acknowledgement Statement

New Mexico Environment Department Surface Water Quality

New Mexico Rapid Assessment Method for Lowland Riverine Wetlands, Rio Grande/Lower Pecos and Regulatory Module for USACE

Quality Assurance Project Plan Acknowledgement Statement

This is to acknowledge that I have received a copy of the QAPP for **New Mexico Rapid Assessment Method for Lowland Riverine Wetlands, Rio Grande/Lower Pecos and Regulatory Module for USACE Project**.

As indicated by my signature below, I understand and acknowledge that it is my responsibility to **read, understand, become familiar with and comply** with the information provided in the document to the best of my ability.

_____
Signature

_____
Name (Please Print)

_____
Date

Return to SWQB Wetlands Program Coordinator (Maryann McGraw)

New Mexico Rapid Assessment Method

Lowland Riverine Wetlands

Draft Data Collection Worksheets